

## Project: PV Parking, Zwolle-NL



Model of the PV Parking from the south-south-west side

### **Summary:**

Site location:	Zwolle, Netherlands
Type of project:	Multi-storey parking
Building size:	360 parking places and 6100 m <sup>2</sup> of office floor area
Ownership:	building society
Location of PV modules:	PV integrated in façades
Total peak power:	30 kW amorphous PV system
PV production:	15-20 MWh (total production from the two blocks)
Start of construction:	May 2001
Start of PV installation:	fourth quarter of 2001
Key partners:	V.o.f. Weezenlandstaete (project developer), Parking Lutzenbergerstraat B.V. (developer), Rudy Uytenhaak Architectenbureau B.V. (architect), Essent (Energy company and PV consultant)

### **General information**

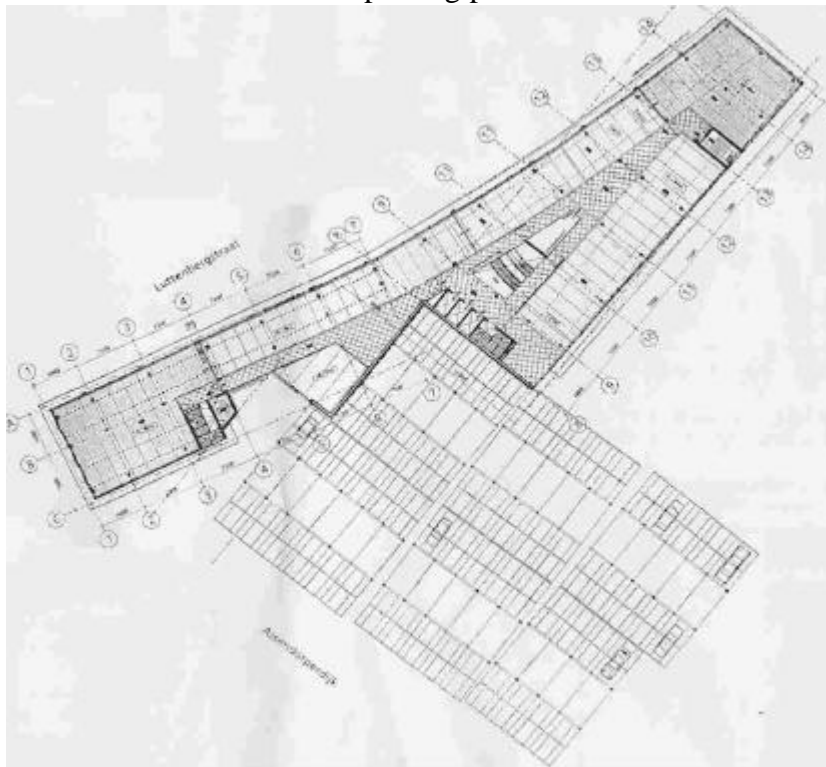
The project consists of a parking in the centre of Zwolle. The parking itself is innovative because the cars are full automatically parked with the use of electrical lifts. This concept has already been developed and realised in other countries and makes it possible to park more cars per m<sup>2</sup>.

In the north-east of the Netherlands a constructor has developed a new variant of this concept. It is based on frames and is very easy to expand in height but it is also possible to have parking places subterranean. This parking is newly developed and the first to be realised in the Netherlands. The concept of automatically parking cars is the first of this concept to be placed in the north-east of the Netherlands. The revolutionary concept is emphasised by the use of a PV system.

The real estate developer is enthusiastic about the project, because the costs of the PV system are almost equal to the costs of a conventional solution by the use of subsidies (under the assumption of prices of PV as indicated). The architect is enthusiastic about the colour and the aesthetic emanation of amorphous silicon.

### **Site information**

Zwolle is a city with a population of app. 100.000 people. As most cities in the Netherlands in the centre are problems with parking. Especially in this situation where a large hospital, a school and government buildings are located. Also people who are visiting the centre of the city Zwolle will need a parking place. These parking places are scarcely and the parking will contribute to the number of parking places in Zwolle.



The municipality of Zwolle is enthusiastic about this project and has approved the plans. Many parking places have already been let out to the staff members of the hospital.

As mentioned the parking is situated in the centre of Zwolle. Because of this location many people will see the facade with the PV system and this will contribute to the knowledge of people of the possibilities of PV.

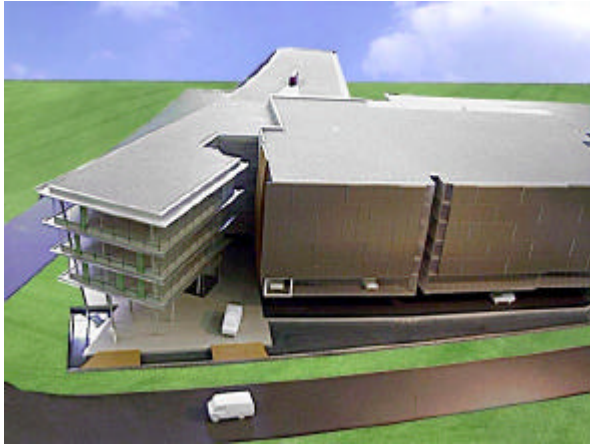
It is to be expected that this type of parking will be placed more in the

Netherlands.

### **The object**

The building consist of a parking (360 cars) and an office (6100 m<sup>2</sup>), which are integrated. The parking can also be used by the people working in the office. The office is not provided with PV systems.

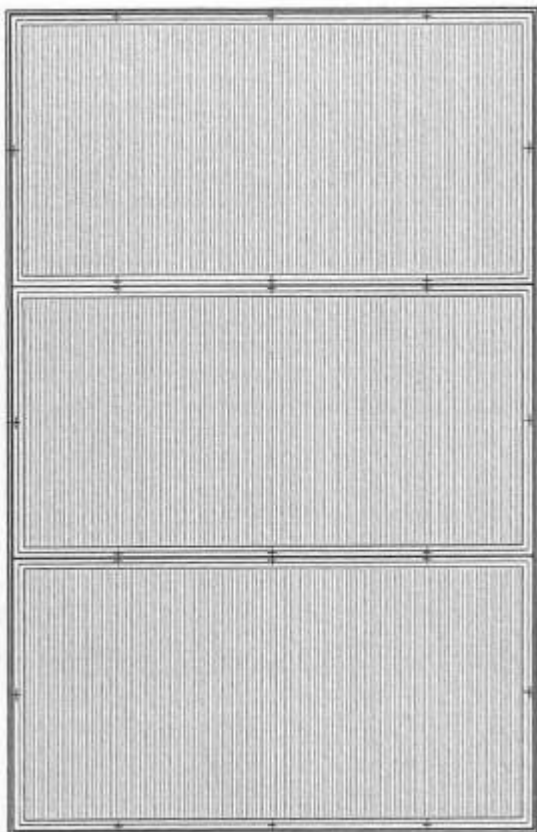
The parking will have approximately 650 m<sup>2</sup> of PV modules at the southwest and southeast oriented façade facing at the street for local citizens. The total peak power will be about 30 kW and the yearly energy production is calculated to 15-20 MWh. It is expected that this amount of energy will provide 100% of the parking's electricity consumption.



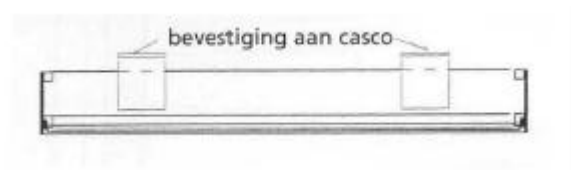
For this project is chosen for an amorphous PV system because of the large surface. An advantage of amorphous is the colour. Because the surface is large the colour of amorphous silicon is not as striking as multi-crystalline silicon; this is strongly preferred by the architect. Furthermore, the costs per m<sup>2</sup> are lower compared with crystalline.

The PV systems will be placed in a specific frame which will be placed at the beams of the

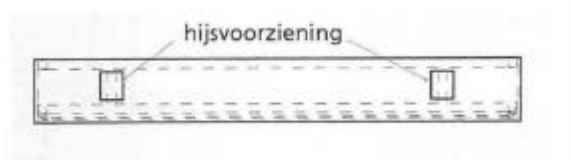
structure of the parking. Frames will be necessary because each frame is too large for one PV panel. Therefore a frame will be constructed which will contain a number of PV panels.



*Frontal view façade element*



*Section*



*Top view*

The choice for PV is logic because the conventional skin of the parking would be glass. This function can be easily overtaken by PV. The parking also does not need insulation, which in this case makes PV a logical replacement.

### ***Monitoring of PV production***

The project has identified the importance of making the tenants involved in the operation of the PV project. The energy production from the PV installation will be monitored. Also data will be presented on a display, located in a place where people who have parked their cars in the parking will see the display.

### ***Additional information on environmental and energy related issues***

The general guidelines for the project can be summarised as follows;

- ?? Efficient use of energy for construction and operation of the buildings
- ?? Reduction in the use of harmful materials

Special care is taken for the electricity consumption of the electric engines used by the lifts. These engines are energy efficient. Besides from lighting the parking does not use more energy. The produced electricity of the PV system will be used in the parking.

### ***Timetable***

The construction of parking and office start in June of 2001. The installation of the PV system will be in fourth quarter of 2001. The total project will be realised in April 2002.

### ***Budget and financing***

The total budget for the PV system of the parking is approximately 313.000 € The project is financed by Parking Luttenberg B.V. with subsidies of the following partners because of the innovative use of PV in this unique concept:

NOVEM	63.500 €
EU-Energie programme	66.000 €
Essent	40.000 €
Parking Luttenberg B.V.	143.500 €

The national subsidy of 63,500€(or: 140,000 NLG) from Novem has been assigned.

### ***Partners***

The project is carried out by the real estate developer Weezenlandstaete and the energy company Essent. The PV supplier has not yet been selected, as this will be subject to an open tender.

### ***Contribution to the PV-NORD project***

The project will demonstrate how PV can be integrated in a non-residential inner-city building instead of a conventional skin. PV has an added value – having both the functions of the normal skin and that of producing energy. In this case of a parking in the city of Zwolle, the Netherlands, the PV system also has an aesthetic function. It fits very well in the Northern attitude to work with less striking material, such as the sober looking PV panels based on amorphous silicon. Also the project will give insight in the use and the performance of amorphous PV systems in the North of Europe in a vertical facade. This project PV Parking Zwolle will demonstrate full scale that both for new and for old buildings the use of PV systems, and in this case amorphous PV systems, can be considered as an alternative for conventional skills of buildings.

As in Northern countries there is a long tradition in rational building and rational energy saving, giving two more arguments for the choice of amorphous silicon. Because most non-residential buildings have large facades, amorphous offers a good alternative, not only because of the colour (aesthetics) of the panels. The second reason is the low costs per m<sup>2</sup>. Even in the façade of a low-cost building like a parking the economic use is within years in sight .

The third reason is the proclaimed relatively large electricity produced per Wp compared with crystalline on a facade, aimed at southeast and southwest at 90 degrees. It is an interesting research contribution of the project to see and measure whether this is true for a full scale application and to compare the results with the outcomes of the carefully monitored 10 kWp amorphous façade on the IKEA office in Sweden.